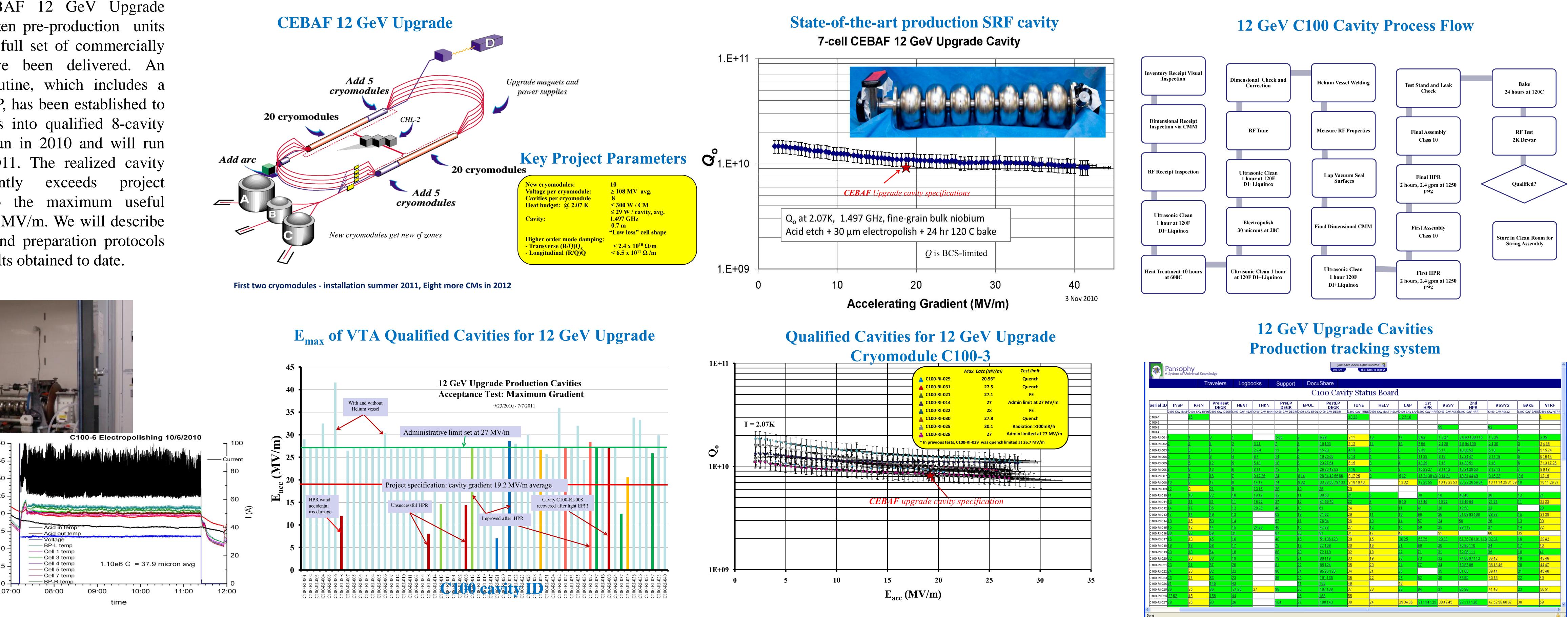
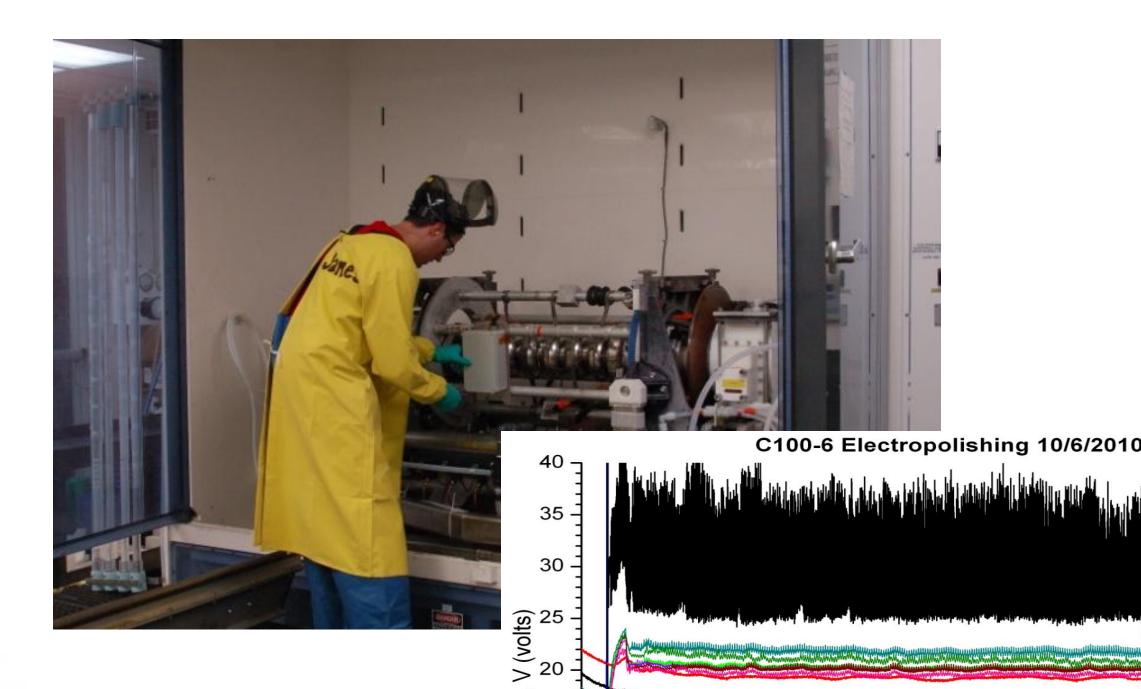


Eighty new 7-cell, LL cell-shaped cavities are required for the CEBAF 12 GeV Upgrade project. In addition to ten pre-production units fabricated at JLab, the full set of commercially produced cavities have been delivered. An efficient processing routine, which includes a controlled 30 micron EP, has been established to transform these cavities into qualified 8-cavity strings. This work began in 2010 and will run through the end of 2011. The realized cavity performance consistently exceeds project requirements and also the maximum useful gradient in CEBAF: 25 MV/m. We will describe the cavity processing and preparation protocols and summarize test results obtained to date.





BP-L temp

Cell 1 temp

Cell 3 temp

- Cell 4 temp

Cell 7 temp

----- Cell 5 temp

Exploiting New Electrochemical Understanding of Niobium Electropolishing for Improved Performance of SRF Cavities for CEBAF C. E. Reece and H. Tian, LINAC10 THP010

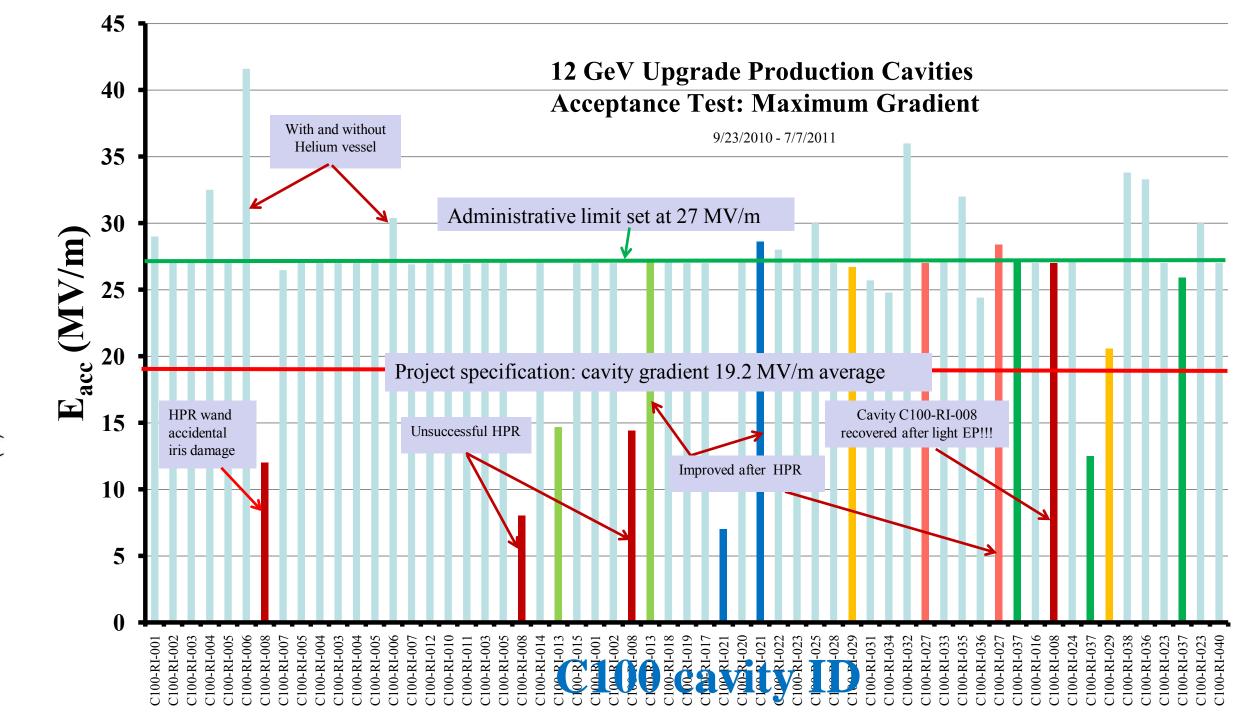
Jefferson Lab



1.10e6 C = 37.9 micron avg

**Production clean room activities** 

# **Preparation and Testing of the SRF Cavities for the CEBAF 12 GeV Upgrade**







**Vertical test Area (VTA): Dewars and control room** 

Funding Agency: Authored by Jefferson Science Associates, LLC under U.S. DOE Contract No. DE-AC05-06R23177

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C100-1 string assembly



|                  |               | Т            | ravelers        | Logbo         | oks           | Support         | Docu          | Share           |                |                    |                 |                    |                 |                     |                       |               |               |
|------------------|---------------|--------------|-----------------|---------------|---------------|-----------------|---------------|-----------------|----------------|--------------------|-----------------|--------------------|-----------------|---------------------|-----------------------|---------------|---------------|
|                  |               |              |                 |               |               |                 | C1            | oo Cavi         | ty Stat        | us Board           |                 |                    |                 |                     |                       |               |               |
|                  | INSP          | RFIN         | PreHeat<br>DEGR | HEAT          | THKN          | PreEP<br>DEGR   | EPOL          | PostEP<br>DEGR  | TUNE           | HELV               | LAP             | 1st<br>HPR         | ASSY            | 2nd<br>HPR          | ASSY2                 | BAKE          | VTRF          |
|                  | 2100-CAV-INSP | C100-CAV-RFI | N C100-CAV-DEGR | C100-CAV-HEAT | C100-CAV-THKN | C100-CAV-DEGR   | C100-CAV-EPOL | C100-CAV-DEGR   | C100-CAV-TUNE  | C100-CAV-INST-HELV | 12718           | C100-CAV-HPR       | C100-CAV-ASSY   | C100-CAV-HPR        | C100-CAV-ASSY2        | C100-CAV-BAKE | C100-CAV-V    |
|                  |               |              |                 |               |               |                 |               |                 | 1023           |                    | 12110           |                    |                 |                     |                       |               | <u>+</u>      |
|                  |               |              |                 |               |               |                 |               |                 |                |                    |                 |                    | <u>55</u>       |                     | <u>62</u>             |               |               |
|                  |               |              |                 |               |               |                 |               |                 |                |                    |                 |                    | 1007            |                     |                       |               |               |
| 1                |               | 1            | 3               | 1             | 0.04          | <u>565</u><br>7 | 2             | <u>699</u>      | <u>211</u>     | 13                 | 17              | <u>562</u>         | <u>1327</u>     |                     | <u>1329</u>           | <u> </u>      | 235           |
| 2                | <u> </u>      | <u> </u>     | 4               | 4             | <u>321</u>    | <u>/</u>        | <u>3</u>      | <u>10103</u>    | <u>312</u>     | 14                 | 19              | <u>7 65</u>        | <u>2428</u>     | <u>4894109</u>      | <u>2430</u>           | <u>3</u>      | <u>3436</u>   |
| 3                | <u>+</u>      | 3            | 8               | 3             | 224           | <u>11</u>       | 4             | <u>1520</u>     | <u>413</u>     | <u>&gt;</u>        |                 |                    | <u>517</u>      | <u>103652</u>       | <u>518</u>            | 4             | <u>51524</u>  |
|                  | 2             | 4            | 9               | 4             | <u>67</u>     | <u>14</u>       | <u>5</u>      | <u>192556</u>   | <u>514</u>     | 4                  | <u>6</u>        | <u>11 32</u>       | <u>616</u>      | <u>123447</u>       | <u>61719</u><br>710   | <u>b</u>      | <u>61614</u>  |
| 5                |               | <u>5</u>     | 12              | <u>5</u>      | <u>510</u>    | <u>18</u><br>70 | <u>b</u>      | <u>23 27 54</u> | <u>615</u>     | 3                  | 4               | <u>1329</u>        | <u>715</u>      | <u>143351</u>       | <u>716</u>            | <u>Þ</u>      | <u>713172</u> |
| 6                | <u>1</u>      | 6            | 13              | 6             | <u>811</u>    | <u>73</u>       | 4             |                 | <u>716</u>     | 2                  |                 |                    | <u>81112</u>    | <u>16242853</u>     | <u>81213</u>          | 4             | <u>8918</u>   |
| 7                |               | 7            | <u>16</u>       | 7             | <u>91225</u>  | 24              | <u>814</u>    |                 | <u>81725</u>   | <u>y</u>           | <u>512</u>      | <u>17 21 30 43</u> |                 | <u>18 31 44 49</u>  | <u>91523</u>          | <u>89</u>     | <u>1219</u>   |
| - 6              | 10            | 8            | 17              | 8             | <u>1417</u>   | 74              | <u>932</u>    |                 | <u>9181940</u> |                    | <u>1332</u>     | <u>192555</u>      | <u>10132353</u> | 20 22 26 56 64      | <u>101114253169</u>   | 10            | <u>101126</u> |
| 9 <mark>1</mark> |               | <u>9</u>     | <u>21</u>       | 9             | <u>1315</u>   | <u>29</u>       | <u>10</u>     | <u>36</u>       | <u>20</u>      |                    |                 |                    |                 |                     |                       |               |               |
| 0                | 11            | <u>10</u>    | 22              | <u>10</u>     | <u>1819</u>   | <u>32</u>       | <u>11</u>     | <u>3960</u>     | <u>21</u>      | 6                  |                 | <u>38</u>          | <u>18</u>       | <u>40 48</u>        | 20                    | 12            | 21            |
| 1                | 13            | <u>11</u>    | <u>31</u>       | <u>11</u>     | <u>1622</u>   | <u>37</u>       | <u>12</u>     | <u>41 59 70</u> | <u>22</u>      | 7                  | <u>910</u>      | <u>37 45</u>       | <u>1922</u>     | <u>39 46 54</u>     | <u>21 24</u>          | <u>11</u>     | <u>22 23</u>  |
| 2                | 4             | <u>17</u>    | <u>35</u>       | <u>12</u>     | <u>2023</u>   | <u>40</u>       | <u>13</u>     | <u>61</u>       | <u>24</u>      | 8                  | <u>11</u>       | <u>41</u>          | <u>20</u>       | <u>4250</u>         | 22                    |               | <u>20</u>     |
| 3                | 17            | <u>14</u>    | <u>49</u>       | <u>13</u>     |               | <u>62</u>       | <u>19</u>     | <u>71 92</u>    | <u>29</u>      | <u>11</u>          | <u>16</u>       | <u>60</u>          | <u>26</u>       | <u>61 68 93 108</u> | <u>2833</u>           | <u>15</u>     | <u>31 38</u>  |
| 4 1              | 18            | <u>15</u>    | <u>53</u>       | <u>14</u>     |               | <u>57</u>       | <u>17</u>     | <u>7684</u>     | <u>26</u>      | <u>10</u>          | <u>14</u>       | <u>57</u>          | <u>24</u>       | <u>58</u>           | <u>26</u>             | <u>13</u>     | <u>30</u>     |
| 5 1              | 1 <u>5</u>    | <u>12</u>    | <u>44</u>       | <u>15</u>     | <u>24 26</u>  | <u>46</u>       | <u>15</u>     | <u>47 88</u>    | <u>27</u>      | <u>12</u>          | <u>15</u>       | <u>59</u>          | <u>25</u>       | <u>99113</u>        | <u>27</u>             | <u>14</u>     | <u>32</u>     |
| 6                | <u>38</u>     | 22           | <u>69</u>       | <u>21</u>     |               | <u>87</u>       | <u>23</u>     | <u>91</u>       | <u>31</u>      |                    | <u>45</u>       |                    | <u>51</u>       |                     | <u>68</u>             | <u>35</u>     |               |
| 71               |               | <u>13</u>    | <u>45</u>       | <u>16</u>     |               | <u>48</u>       | <u>16</u>     | <u>51106123</u> | <u>28</u>      | <u>15</u>          | <u>2025</u>     | <u>6675</u>        | <u>2933</u>     |                     | <u>3237</u>           | <u>16</u>     | <u>39 42</u>  |
| 8 1              |               | <u>18</u>    | <u>58</u>       | 17            |               | <u>75</u>       | <u>18</u>     | <u>77109</u>    | <u>30</u>      | <u>16</u>          | <u>21</u>       | <u>69</u>          | <u>30</u>       | <u>7095110</u>      | <u>34</u>             | 17            | <u>40</u>     |
| 19               |               | <u>19</u>    | <u>64</u>       | <u>18</u>     |               | <u>68</u>       | 20            | <u>72118</u>    | <u>32</u>      | <u>18</u>          | 22              | <u>71</u>          | <u>31</u>       | <u>7296111</u>      | <u>35</u>             | <u>18</u>     | <u>41</u>     |
| :0 2             | 22            | <u>20</u>    | <u>63</u>       | <u>19</u>     |               | <u>78</u>       | <u>21</u>     | <u>80119</u>    | <u>33</u>      | <u>19</u>          | <u>23</u>       | <u>73</u>          | <u>32</u>       | <u>748697112</u>    | <u>3642</u>           | <u>19</u>     | <u>43 46</u>  |
| :1               |               | <u>21</u>    | <u>67</u>       | <u>20</u>     |               | <u>81</u>       |               | <u>85124</u>    | <u>35</u>      | 20                 | 24              | 77                 | <u>34</u>       | <u>798789</u>       | <u>38 43 45</u>       | <u>20</u>     | <u>44 47</u>  |
| 2                | 24            | <u>23</u>    | <u>82</u>       | <u>22</u>     |               | <u>90</u>       | <u>24</u>     | <u>9596128</u>  | <u>34</u>      | <u>21</u>          | <u>26</u>       |                    | <u>35</u>       | <u>81 88</u>        | <u>3944</u>           | <u>21</u>     | <u>45 48</u>  |
| 3                |               | <u>24</u>    | <u>83</u>       | <u>23</u>     |               | <u>89</u>       | <u>25</u>     |                 | <u>36</u>      | 22                 |                 | <u>82</u>          | <u>36</u>       | <u>83 90</u>        | <u>40 46</u>          | <u>22</u>     | <u>49</u>     |
| 4                |               |              | <u>145</u>      | <u>42</u>     |               |                 | <u>41</u>     |                 | <u>49</u>      |                    | <u>46</u>       |                    |                 |                     |                       |               |               |
| 5                |               | <u>25</u>    | 86              |               | <u>27</u>     | <u>98</u>       | <u>26</u>     | <u>107138</u>   | <u>37</u>      | 23                 | <u>28</u>       | <u>84</u>          | <u>37</u>       | <u>85 98</u>        | <u>41 48</u>          | 23            | <u>50 51</u>  |
| -2               |               | <u>45</u>    | <u>156</u>      | <u>44</u>     |               |                 | <u>46</u>     |                 | <u>55</u>      |                    |                 |                    |                 |                     |                       |               |               |
| 7                | 29            | <u>26</u>    | 93              | <u>26</u>     |               | <u>104</u>      | 27            | <u>108143</u>   | <u>38</u>      | <u>24</u>          | <u>29 34 36</u> | <u>91 114 125</u>  | 38 42 45        | <u>92117126</u>     | <u>47 52 58 60 67</u> | 30            | <u>59</u>     |

### **Summary:**

- 86/86 cavities received
- 60/86 cavities electro-polished
- 40/86 cavities VTA tested
- 38/86 cavities qualified in helium vessel
- 32/86 cavities = 4 /10 strings completed, ready for #5
- Procedure suite established and tracked
- No SRF cavity performance issues currently open

## Acknowledgments: JLAB SRF Institute Team

15th International Conference on RF Superconductivity

July 25-29, 2011

